Claims

1. An audio processor comprising:

a variable filter receiving an input signal and providing an output signal, said variable filter having a fixed cutoff frequency and a quality factor that is controllable in response to a control signal; and

a control circuit configured to detect a signal level representative of input signal level in a selected band and to generate the control signal in response to the detected signal level.

2. An audio processor as defined in claim 1, wherein said variable filter comprises a high-pass state variable filter.

3. An audio processor as defined in claim 1, wherein said control circuit comprises a low-pass filter configured for passing the selected band.

4. An audio processor as defined in claim 3, wherein said control circuit further comprises a detector configured for detecting the signal level in the selected band and for establishing time constants of the control signal.

5. An audio processor as defined in claim 4, wherein the control signal has an attack time constant of about 5 milliseconds or less and a decay time constant in a range of about 0.5 to 2.0 seconds.

6. An audio processor as defined in claim 1, wherein said control circuit is configured to establish an inverse relationship between the quality factor of the variable filter and the detected signal level.

7. An audio processor as defined in claim 1, wherein said control circuit is configured to detect the output signal.

8. An audio processor as defined in claim 1, wherein said variable filter comprises a fixed band-pass filter in series with a variable gain element responsive to the control signal to provide a controlled band-pass signal, and a summer for combining the controlled band-pass signal and the input signal to provide the output signal.

9. An audio processor as defined in claim 3, wherein said low-pass filter comprises an active low-pass filter.

10. An audio processor as defined in claim 4, wherein said detector comprises an active detector.

11. An audio processor as defined in claim 4, wherein said detector comprises a peak detector.

12. An audio processor as defined in claim 1, wherein said control circuit is configured to control bass audio frequencies to limit the Fletcher-Munson effect.

13. An audio processor as defined in claim 4, wherein said control circuit further comprises a non-linear amplifier.

14. An audio processor as defined in claim 1, wherein said variable filter comprises a digital filter receiving an input data stream and providing a filtered output data stream, and wherein the control signal comprises a control variable.

15. An audio processor as defined in claim 14, wherein said control circuit comprises a digital low-pass filter for passing the selected band and a detector algorithm configured for detecting the signal level in the selected band and for generating the control variable in response to the detected signal level.

16. An audio processor as defined in claim 14, wherein the quality factor of the digital filter is controlled by changing the coefficients of the digital filter.

17. An audio processor as defined in claim 14, wherein the digital filter includes a lookup table for establishing a desired relationship between the quality factor of the digital filter and the detected signal level.

18. An audio processor as defined in claim 15, wherein the detector algorithm establishes time constants of the control variable.

19. An audio processor as defined in claim 18, wherein the control variable has an attack time constant of about 5 milliseconds or less and a decay time constant in a range of about 0.5 to 2.0 seconds.

20. An audio processor as defined in claim 15, wherein the detector algorithm comprises an RMS detector algorithm.

21. An audio processor as defined in claim 15, wherein the digital low-pass filter comprises a digital biquad low-pass filter.

22. An audio processor as defined in claim 1, wherein the variable filter includes a voltage-controlled resistor circuit for controlling the quality factor in response to the control signal.

23. An audio processor as defined in claim 1, wherein the variable filter includes a series gain/attenuation element for controlling the quality factor in response to the control signal.

24. An audio processor comprising:

a variable filter receiving an input signal and providing a filtered output signal, said variable filter having a fixed cutoff frequency and a quality factor that is controllable in response to a control signal;

a low-pass filter for selecting a band of the output signal; and

a detector for detecting a signal level in the band selected by the low-pass filter and for generating the control signal in response to the detected signal level.

25. An audio processor as defined in claim 24, wherein the detector is configured for establishing time constants of the control signal.

26. An audio processor as defined in claim 25, wherein the control signal has an attack time constant of about 5 milliseconds or less and a decay time constant in a range of about 0.5 to 2.0 seconds.

27. An audio processor as defined in claim 24, wherein said low-pass filter and said detector are components of a control circuit which establishes an inverse relationship between the quality factor of the state variable filter and the detected signal level.

28. An audio processor as defined in claim 24, wherein said state variable filter has a cutoff frequency of about 70 Hz.

29. An audio processor as defined in claim 24, wherein said low-pass filter comprises an active low-pass filter.

30. An audio processor as defined in claim 29, wherein said detector comprises an active detector.

31. An audio processor as defined in claim 24, wherein said detector comprises a peak detector.

32. An audio processor as defined in claim 24, wherein said low-pass filter and said detector are configured to control bass audio frequencies to the limit the Fletcher-Munson effect.

33. An audio processor as defined in claim 24, further comprising a non-linear amplifier coupled to said detector.

34. An audio processor as defined in claim 24, wherein said variable filter comprises a fixed band-pass filter in series with a variable gain element responsive to the control signal to provide a controlled band-pass signal, and a summer for combining the controlled band-pass signal and the input signal to provide the filtered output signal.

35. An audio processor as defined in claim 24, wherein said variable filter comprises a digital filter receiving an input data stream and providing a filtered output data stream.

36. An audio processor as defined in claim 35, wherein said low-pass filter comprises a digital biquad low-pass filter.

37. An audio processor as defined in claim 35, wherein said detector comprises an RMS detector algorithm.

38. An audio processor as defined in claim 35, wherein the digital filter includes a lookup table for establishing a desired relationship

between the quality factor of the digital filter and the detected signal level.

39. An audio processor as defined in claim 24, wherein the variable filter includes a voltage-controlled resistor circuit for controlling the quality factor in response to the control signal.

40. An audio processor as defined in claim 24, wherein the variable filter includes a series gain/attenuation element for controlling the quality factor in response to the control signal.

41. An audio processing method comprising:

filtering an input signal in a variable filter and providing a filtered output signal;

detecting a signal level representative of input signal level in a selected band to provide a detected signal level; and

controlling a quality factor of the variable filter in response to the detected signal level.

42. An audio processing method as defined in claim 41, wherein filtering the input signal comprises filtering the input signal in a high-pass state variable filter.

43. An audio processing method as defined in claim 41, further comprising low-pass filtering of the output signal in the selected band prior to detecting the signal level.

44. An audio processing method as defined in claim 41, wherein controlling the quality factor of the variable filter comprises controlling the quality factor with a control signal having predetermined time constants.

45. An audio processing method as defined in claim 44, wherein the control signal has an attack time constant of about 5 milliseconds or less and a decay time constant in a range of about 0.5 to 2.0 seconds.

46. An audio processing method as defined in claim 41, wherein controlling the quality factor of the variable filter comprises establishing an inverse relation between the quality factor of the variable filter and the detected signal level.

47. An audio processing method as defined in claim 41, wherein controlling the quality factor of the variable filter comprises maintaining a fixed cutoff frequency of the variable filter.

48. An audio processing method as defined in claim 41, wherein detecting the signal level comprises detecting the output signal in the selected band.

49. An audio processing method as defined in claim 41, wherein controlling the quality factor of the variable filter comprises controlling bass audio frequencies to limit the Fletcher-Munson effect.

50. An audio processing method as defined in claim 41, wherein controlling the quality factor of the variable filter comprises controlling the quality factor according to a non-linear function of detected signal level.

51. An audio processing method as defined in claim 41, wherein filtering the input signal comprises filtering an input data stream with a digital high-pass state variable filter and providing a filtered output data stream.

52. An audio processing method as defined in claim 51, further comprising low-pass filtering of the output data stream with a digital biquad low-pass filter.

53. An audio processing method as defined in claim 51, wherein detecting the signal level comprises detecting the signal level with an RMS detector algorithm.

54. An audio processing method as defined in claim 51, wherein controlling the quality factor of the variable filter comprises changing the coefficients of the digital filter.

55. An audio processing method as defined in claim 51, wherein controlling the quality factor of the variable filter comprises accessing control values in a lookup table in response to the detected signal level.

56. An audio processor comprising:

a state variable digital high-pass filter receiving an input data stream and providing a filtered output data stream, said digital filter having a fixed cutoff frequency and a quality factor that is controllable in response to a control variable;

a digital band select filter for selecting a band of the output data stream; and

a detector algorithm for detecting a signal level in the band selected by the digital band select filter and for generating the control variable in response to the detected signal level.